HM-657

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Lutz Rose, et al.

Serial No: 10/557,190

Filed: November 18, 2005

For: METHOD FOR PRODUCING FOAMED SLAG ON HIGH-CHROMIUM MELTS IN AN ELECTRIC FURNACE

Examiner: Jie Yang

Art Unit: 1793

Mail Stop: Appeal Brief-Patents
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

BRIEF ON APPEAL

S I R:

Applicant hereby requests a one-month extension of time for filing the present Brief on Appeal. Enclosed is a credit card payment form in the amount of $130 in payment of the government fee for a one-month extension of time.

03/16/2010 CCHAU1 00000017 10557190
01 FC:1402 540.00 OP

03/16/2010 CCHAU1 00000017 10557190
02 FC:1251 130.00 OP

This appeal is taken from the Final Action mailed June 8, 2009.

Real Party in Interest

The real party in interest in the above-identified application is:

SMS Demag AG
Eduard-Schloemann-Strasse 4
DE-40237 Düsseldorf
Germany

Related Appeals and Interferences

There are no related appeals or interferences of which Applicant is aware regarding the above-identified application.

Status of Claims

Claims 1 and 5-11 are pending in the application and are subject to the present appeal. Claims 2-4 have been canceled. Claims 1, 5-8, 10 and 11 stand rejected under 35 U.S.C. 103(a) over U.S. Patent No. 3,807,986 to Funk et al. in view of U.S. Patent No. 6,228,137 to Guillot et al. Claim 9 stands rejected under 35 U.S.C. 103(a) over Funk et al. and Guillot et al., and further in view of EP 0655508 to Masucci et al.

Status of Amendments After Final Rejection

No response after final was filed.

Summary of the Claimed Subject Matter

The claimed invention will now be summarized with reference to the drawings being made by way of reference numerals.

Independent Claim 1

The claimed invention recites a method for producing foamed slag (7) on high-chromium steel melts (6) in an electric arc furnace (1), wherein a mixture of a metal oxide and carbon is introduced into the furnace (1), the metal oxide is reduced by the carbon in the slag (7), and the resulting gases form bubbles in the slag, which thus cause the slag to foam (see page 1, lines 3-8 of the specification). The mixture of metal oxide and carbon is introduced into the furnace as compressed preforms (8) or preforms (8) provided with a binder (see page 4, lines 4-7). The density of the preforms (8) is adjusted by compression pressure and a type and quantity of an added iron carrier (see page 4, lines 16-18) so that the preforms are heavier than the slag (7) but lighter than the metal melt (6) (see page 4, line 22 - page 5, line 2) and float in the slag near a phase boundary between the metal melt (6) and the slag (7) (see page 4, lines 20-22).

Grounds of Rejection to be Reviewed on Appeal

The following grounds are presented for review:

Whether claims 1, 5-8, 10 and 11 are unpatentable under 35 U.S.C. 103(a) over Funk et al. in view of Guillot et al.

Whether claim 9 is unpatentable under 35 U.S.C. 103(a) over Funk et al. in view of Guillot et al., and further in view of Masucci et al.

Argument

The Rejection of Claims 1, 5-8, 10 and 11 under 35 U.S.C. 103(a):

In rejecting claims 1, 5-8, 10 and 11, the Examiner stated the following:

"Funk discloses a method for creating a vigorous carbon boil in a steel bath and an eruption of slag plumes in an electric arc furnace during a steelmaking process wherein a compressed preform, particularly a briquette comprising metal oxides and carbon, is introduced *through* the slag layer *onto* the molten metal bath of an electric arc furnace. Funk discloses the effective density of the briquettes to be about 5.5 grams per cubic centimeter which will allow the briquette to penetrate the slag layer and enable melting of the briquette and carbon-oxygen reaction to occur simultaneously and predictably (see abstract, claims 1 and 6-7, and col. 3 lines 36-41).

While Funk does not explicitly state how such a density is to be achieved, Funk discloses that the size, shape, and mass of the briquettes, all of which relates to density, govern their ability to penetrate the slag upon their introduction into the furnace. In addition, compacting or sizing operations are known in the art to affect the physical properties of a compacted product (see col. 9 lines 39-43 and col. 4 lines 41-45).

Given Funk's disclosure, it would have been obvious to one having ordinary skill in the art during production of the briquette to adjust the density by compacting or sizing operations in order to achieve the density specified by Funk.

Given the introduction of the briquettes through the slag on the top of the steel bath and the density of the briquettes as 5.5 grams per cubic centimeter, it would be inherent that the preforms are heavier than the slag but lighter than the molten steel and float in the slag near a phase boundary between the metal melt and the slag.

Given the commonalities between the method of Funk and the claimed method, it would be reasonable to expect that the occurrences of reduction of metal oxide by carbon in the slag, which result in the formation of gas bubbles in the slag, thereby causing the slag to foam are present in Funk's method as well. This is supported by Funk's disclosure of a vigorous carbon boil and eruption of slag plumes upon receipt of the briquettes (see claims 1 and 6).

In disclosing such a method as described above, Funk does not identify the steel melt as being a high-chromium steel melt.

Guillot, in disclosing a process for producing a foaming slag melted in an electric arc furnace, teaches the addition of a metal oxide and carbon to a high-chromium steel melt, particularly a stainless steel melt, in an electric arc furnace (see abstract, Field of the Invention section and Summary of the Invention section).

It would have been obvious to one of ordinary skill in the art to modify the method of Funk with the stainless steel melt of Guillot in order to facilitate the foaming of slag in a stainless steel melt thereby protecting the melt and moderating the temperature of the process.

With regards to the adjustment of the density by compacting the preforms as recited in claims 5 and 6, this step was addressed in a discussion of Funk's method. Given the coverage of this step by Funk, it is reasonable to expect that the density of Funk allows for the preforms to disintegrate uniformly and slowly, whereby an evolution of gas in the slag occurs uniformly preforms a relatively long period of time as in claim 5 and allows for the preforms to disintegrate with a time delay as in claim 6.

With regards to the addition of flux as required by claim 7, Funk discloses the briquettes can have additional materials such as fluxes mixed with them to produce self fluxing characteristics (see col. 2 lines 64-68).

With regards to the addition of a slag thinner as recited in claim 8, Funk does not explicitly disclose the addition of CaF_2 to the briquette. However, funk discloses that the briquettes may have additional different materials mixed with them to produce

desirable properties and effects and discloses the addition of fluorspar, a mineral composed of CaF_2, as being a known additive in an electric furnace steelmaking process (see col. 1 lines 15-17, col. 1 lines 31-37 and col. 2 lines 64-67). Therefore, it would have been obvious to one having ordinary skill in the art to modify the briquette of Funk to include the fluorspar known in the art in order to facilitate the thinning of slag.

With regards to the introduction of the preforms as required by claims 10 and 11, Funk discloses the introduction of the briquettes through the furnace roof via duct 21 which allows the material to fall directly into the center of the electrode delta formed by electrodes 29 (see col. 5 line 66-col. 6 line 3 and Figure 2)."

Funk et al. disclose a combination iron and iron oxide briquette.

Guillot et al. disclose a process for producing foaming slag above a stainless steel melted in an electric furnace.

The Examiner combined Guillot et al. and Funk et al. in determining that claims 1, 5-8, 10 and 11 would be unpatentable over such a combination. The combination does not teach introducing preforms having a density adjusted by pressure and a type and quantity of an added iron carrier so that the preforms are heavier than the slag but lighter than the metal melt, as in the presently claimed invention. Although Guillot et al. do teach that the briquettes have a certain density, they do not teach, nor would it be obvious, to adjust the density of the preforms by

compression pressure and a type and quantity of an added iron carrier so that the preforms are heavier than the slag but lighter than the metal melt and float in the slag near a phase boundary between the metal melt and the slag, as recited in independent claim 1. It is not inherent from the teachings of Funk that the briquettes should be lighter than the metal melt and float in the slag.

In view of these considerations it is submitted that the rejection of claims 1, 5-8, 10 and 11 under 35 U.S.C. 103(a) over a combination of the above-discussed references is in error and should be overturned.

The Rejection of Claim 9 under 35 U.S.C. 103(a):

In rejecting claim 9, the Examiner stated the following:

"Neither Funk nor Guillot disclose the presence of a reducing agent in the briquette...

Mascucci, in disclosing a process for producing foamed slag in stainless steel production in an electric arc furnace, teaches the charging of silicon in order to protect the chromium in the bath from oxidation (see Field of the Invention section, col. 2 lines 55-col. 3 line 1 and col. 4 lines 1-2).

It would have been obvious to one of ordinary skill in the art to modify the method taught by the combination of Funk and

Guillot with the silicon of Masucci in order to protect the chromium in the bath from oxidation and facilitate the production of foaming slag by addition of a reducing agent."

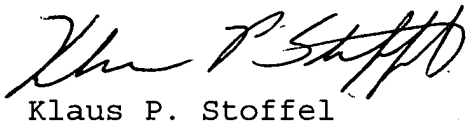
Claim 9 stands and falls with independent claim 1. Applicant submits that Lu et al. add nothing to the teachings of the previously discussed references so as to suggest the presently claimed invention. Thus, it is submitted that the rejection of claim 9 under 35 U.S.C. 103(a) is in error and should be overturned.

Conclusion

Accordingly, in view of the above considerations, it is Applicant's position that the Examiner's rejections of claims 1 and 5-11 under 35 U.S.C. 103(a) are in error and should be reversed.

The amount of $540.00 to cover the fee for filing an appeal brief is being charged as per attached form PTO-2038. Any additional fees or charges required at this time in connection with this application should be charged to Patent and Trademark Office Deposit Account No. 11-1835.

Respectfully submitted,

By 

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Dated: March 11, 2010

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, PO Box 1450 Alexandria, VA 22313-1450, on March 11, 2010.

By: 
Klaus P. Stoffel

Date: March 11, 2010

Claims Appendix

1. Method for producing foamed slag (7) on high-chromium steel melts (6) in an electric arc furnace (1), wherein a mixture of a metal oxide and carbon is introduced into the furnace (1), the metal oxide is reduced by the carbon in the slag (7), and the resulting gases form bubbles in the slag, which thus cause the slag to foam, wherein the mixture of metal oxide and carbon is introduced into the furnace as compressed preforms (8) or preforms (8) provided with a binder, wherein density of the preforms (8) is adjusted by compression pressure and a type and quantity of an added iron carrier so that the preforms are heavier than the slag (7) but lighter than the metal melt (6) and float in the slag near a phase boundary between the metal melt (6) and the slag (7).

5. Method in accordance with Claim 1, wherein the density of the preforms (8) is adjusted by compacting the preforms (8) so that the preforms disintegrate uniformly and slowly, whereby an evolution of gas in the slag (7) occurs uniformly and over a relatively long period of time.

6. Method in accordance with Claim 1, wherein the density of the preforms (8) is adjusted by compacting the preforms (8) so that the preforms disintegrate with a time delay.

7. Method in accordance with Claim 1, wherein a flux is additionally added to the mixture.

8. Method in accordance with Claim 1, wherein a slag thinner is additionally added to the mixture.

9. Method in accordance with Claim 1, wherein a reducing agent is additionally added to the mixture.

10. Method in accordance with Claim 1, wherein the preforms (8) are introduced through the sidewalls (10) and the furnace roof (4) of the electric arc furnace (1).

11. Method in accordance with Claim 1, wherein the preforms (8) are introduced into the slag (7) in a directed way in the vicinity of or directly at the hot spots of the electrodes (5a-c).

Evidence Appendix

N.A.

Related Proceedings Appendix

There are no related proceedings.